The U.S. Department of Energy's Office of Science: Steward of 10 World-Class National Laboratories

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Introduction
Steward of 10 National Laboratories

The Department of Energy's Office of Science is the steward of 10 world-class laboratories, which often are called the "crown jewels" of our national research infrastructure. The national laboratory system, created over a half-century ago, is the most comprehensive research system of its kind in the world.

These laboratories perform research and development that is not well suited to university or private sector research facilities because of its scope, infrastructure, or multidisciplinary nature, but for which there is a strong public and national purpose. A high level of collaboration among all of the national laboratories in the use of world-class scientific equipment and supercomputers, facilities, and multidisciplinary teams of scientists increases their collective contribution to DOE and the Nation, making the laboratory system more valuable as a whole than as the sum of its parts.

Five of the Office of Science national laboratories are multi-program facilities:

- Argonne National Laboratory
- Brookhaven National Laboratory
- Lawrence Berkeley National Laboratory
- Oak Ridge National Laboratory
- Pacific Northwest National Laboratory.

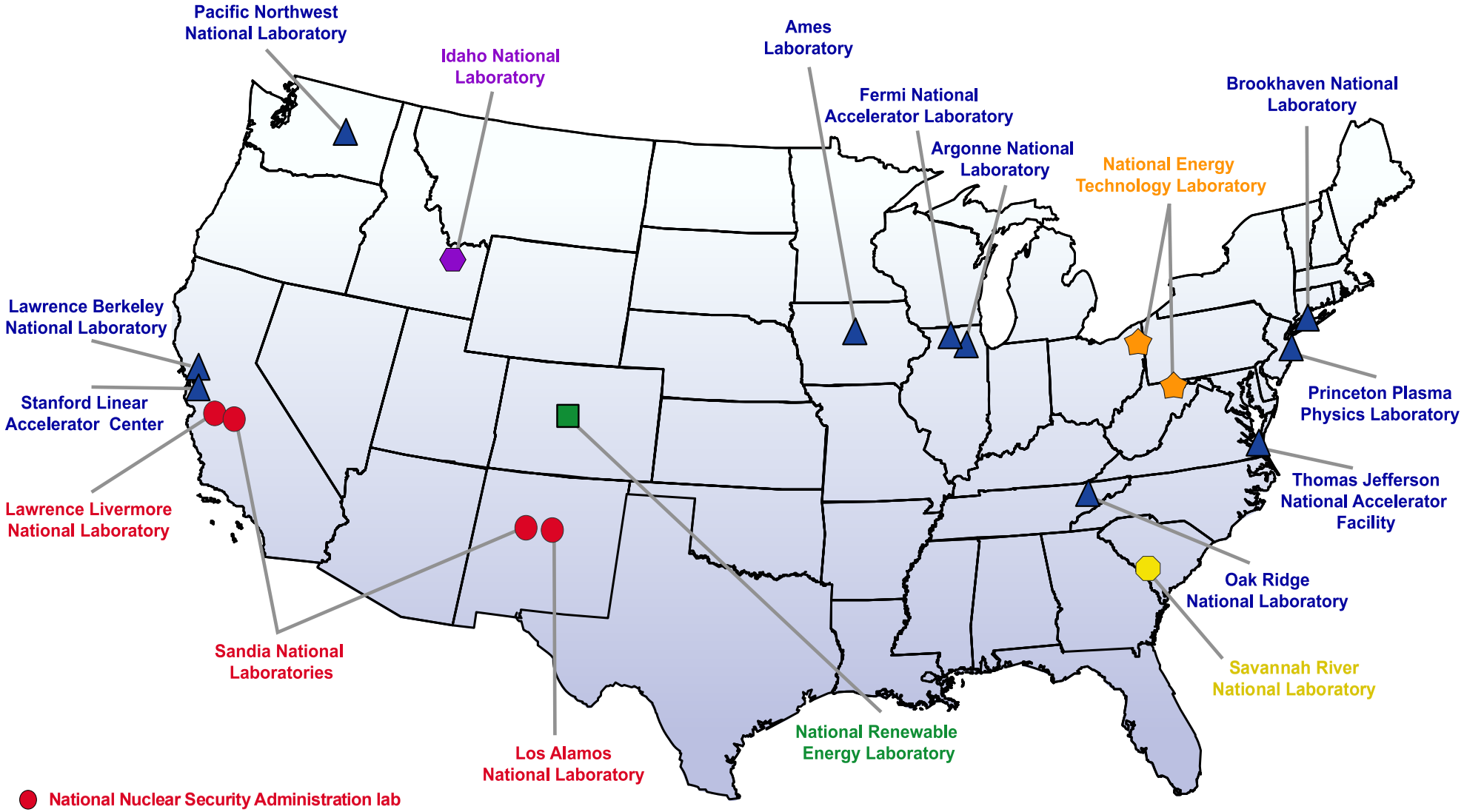
The other five Office of Science national laboratories are single-program facilities:

- Ames Laboratory
- Fermi National Accelerator Laboratory
- Thomas Jefferson National Accelerator Facility
- Princeton Plasma Physics Laboratory
- Stanford Linear Accelerator Center.

The Office of Science also funds research and development projects conducted at these additional national laboratories, which are overseen by other DOE offices:

- Idaho National Laboratory (DOE's Office of Nuclear Energy, Science and Technology)
- Lawrence Livermore National Laboratory (DOE's National Nuclear Security Administration)
- Los Alamos National Laboratory (DOE's National Nuclear Security Administration)
- National Energy Technology Laboratory (DOE's Office of Fossil Energy)
- National Renewable Energy Laboratory (DOE's Office of Energy Efficiency and Renewable Energy)
- Sandia National Laboratory (DOE's National Nuclear Security Administration)
- Savannah River National Laboratory (DOE'S Office of Environmental Management).

Department of Energy National Laboratories



AMES LABORATORY

Leadership in Science

Ames Laboratory conducts research in various areas of national concern, including the synthesis and study of new materials, energy resources, high-speed computer design, and environmental cleanup and restoration. Located in Ames, IA, on the campus of Iowa State University, the Laboratory was founded in 1947 following work to produce purified uranium for the Manhattan Project. Today, Laboratory scientists are actively involved in innovative research, science education programs, the development of applied technologies, and the quick transfer of such technologies to industry. The Laboratory supplies roughly 17 percent of the federal research funding received by Iowa State University, which runs the Lab for the U.S. Department of Energy's (DOE) Office of Science.

Mission

Ames Laboratory's mission is to conduct basic and applied research in the chemical, materials, mathematical, engineering and environmental sciences, and physics in support of DOE's mission and vision; to transfer technologies to improve industrial competitiveness; and to educate the next generation of scientists and engineers.

Core Competencies

- Materials design, synthesis and processing
- Analytical instrumentation/device design/fabrication
- Condensed matter theory (including photonic band gap and other novel materials)
- Materials characterization, X-ray and neutron scattering, solid state nuclear magnetic resonance (NMR), and spectroscopy/microscopy
- Separation science

Major User Facilities

Materials Preparation Center (MPC), provides advanced materials to industry, university, and government research centers.
Iowa Companies Assistance Program, a specialized service of the MPC, provides technical expertise to Iowa companies.

Recent Scientific Achievements

- Significant advancements in research on left-handed materials, also known as metamaterials, could lead to the development of a flat superlens with the power to see inside a human cell.
- Patented lead-free solder formula licensed by more than 60 companies worldwide to help meet restrictions banning lead from consumer products.
- Exploring the use of mesoporous nanoparticles to selectively deliver drug or gene therapies inside targeted cells while

Lab-at-a-Glance

Location: Ames, IA

Contract Operator: Iowa State University (ISU) of Science and Technology

Responsible Field Office: Ames Site Office

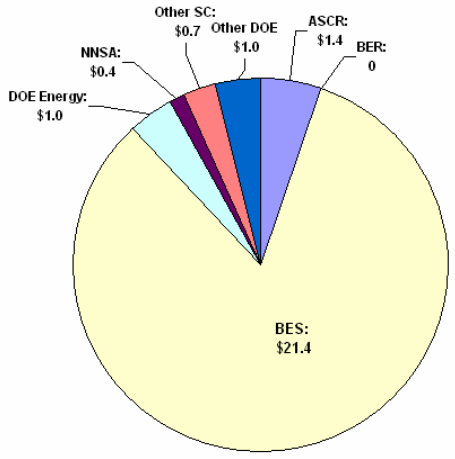
Website: http://www.ameslab.gov/

Human Capital:

- 315 Full-time equivalent employees;
- 194 ISU grad/undergrad students
- 149 Facility users, visiting scientists, and associates

FY 2006 Total DOE Funding: $25.9M

FY 2006 DOE Funding by Source
PALS data (BA in Millions):



FY 2006 Non-DOE Funding: $2.4M

BES: Basic Energy Sciences
BER: Biological and Environmental Research
ASCR: Advanced Scientific Computing Research
NNSA: National Nuclear Security Administration

leaving healthy cells untreated and unharmed by dangerous side affects.

- Developed a software program that can quickly analyze and detect if a computer image has been altered with other secretly embedded, or steganographic, computer data.
- Discovery of the structure of fuel cell membranes using nuclear magnetic resonance imaging.
- Developed polymer materials that self-assemble and react to changes in temperature and pH similar to naturally occurring proteins and biomolecules.

Awards

- 16 R&D Awards
- European Union's Descartes Prize for Excellence in Scientific Collaborative Research in Physics in 2005.
- Five National Academy of Engineering inductees.
- National Academy of Science inductee in 2002.
- American Chemical Society Awards in both Chromatography and Theoretical Chemistry in 2002.

Argonne NATIONAL LABORATORY

Leadership in Science

Argonne National Laboratory offers world-class scientific and technical capabilities for research in materials and nuclear physics, development of nuclear technology, and energy-efficient technologies for the transportation, utility, and industrial sectors. Designated as the Nation's first national laboratory in 1946, Argonne occupies 1,500 acres about 25 miles southwest of downtown Chicago. Argonne scientists conduct basic and applied research across a wide spectrum of disciplines supporting DOE's mission areas of national security, energy, environmental remediation, and science.

Mission

Argonne's mission is to serve DOE in advancing energy independence, exploring nuclear matter, advancing the frontiers of computer science, and providing world-class facilities that enable great science and lead to innovative and effective solutions to energy, environmental, and security challenges to national and global well-being.

Core Competencies

- Fundamental science and engineering expertise in materials sciences; chemistry; atomic, high-energy and nuclear physics; multidisciplinary nanoscience and nanotechnology; structural biology, functional genomics, and bioinformatics; environmental science and technology; and applied mathematics and computer science.
- Design, construction, and operation of accelerator-based user facilities that enable world-class research.
- Design, development, and evaluation of advanced nuclear energy systems and proliferation-resistant nuclear fuel cycle technologies for a safe, environmentally sound energy future.

Major User Facilities

Advanced Photon Source (APS), provides the Nation's most brilliant hard-x-ray beam for research in materials science, structural biology, environmental studies, applied engineering, and other areas.

Argonne Tandem-Linac Accelerator System (ATLAS), provides high-quality low-energy beams of heavy ions for research in nuclear physics.

Intense Pulsed Neutron Source (IPNS), a primary tool for research by the international neutron-scattering community.

Lab-at-a-Glance

Location: Argonne, IL

Contract Operator: UChicago Argonne LLC

Responsible Site Office: Argonne Site Office

Website: http://www.anl.gov/

Human Capital:

- 2900 employees
- 500 Students (Undergraduate and Graduate);
- 5750 Facility Users and Visiting Scientists

FY 2006 Total DOE Funding: $325.9M

FY 2006 DOE Funding by Source

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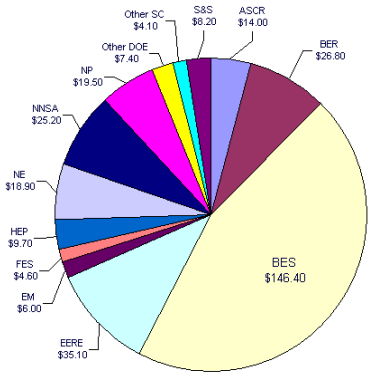


FY 2006 Non-DOE Funding: $138M

BES: Basic Energy Sciences
BER: Biological and Environmental Research
HEP: High Energy Physics
NP: Nuclear Physics
FES: Fusion Energy Sciences
ASCR: Advanced Scientific Computing Research
EM: Environmental Management
NNSA: National Nuclear Security Administration
EERE: Energy Efficiency and Renewable Energy
NE: Nuclear Energy
S&S: Safety and Security

Recent Scientific Achievements

- Contributed the structures of 1,000 proteins to the Protein Data Bank, used by scientists worldwide to improve understanding of human and environmental health; structures include edema factor, one of the molecules that enable anthrax bacteria to cause disease in humans.
- Captured the world's first images of hydrogen combustion in an internal combustion engine operating at real-world speeds and loads; this window into the inner workings of a hydrogen-powered engine is helping to optimize the engines for street use some day.
- Developed the first catalyzed reformer that enables a fuel-cell powered vehicle to operate on conventional gasoline.
- A collection of software services and libraries, called The Globus Toolkit, are the basis of collaborative science and engineering projects worldwide.

Awards

- Three Nobel Prizes
- Two Enrico Fermi Prizes
- Nine E.O. Lawrence Awards
- 95 R&D 100 Awards

BROOKHAVEN NATIONAL LABORATORY

Leadership in Science

Brookhaven National Laboratory's mission is to produce excellent science and advanced technology in a safe, environmentally sound manner with the cooperation, support, and appropriate involvement of its many communities. Established in 1947, Brookhaven today is a world leader in accelerator-based science and technology. The Laboratory's two large user facilities, the Relativistic Heavy Ion Collider and the National Synchrotron Light Source, can probe nearly the entire range of scales – from human-sized to elementary particles – of interest to most areas of physical and biological science

Mission

Brookhaven supports DOE's strategic missions in carrying out basic and applied research in long-term programs at the frontiers of science.

Core Competencies

- Design, engineering, and operation of accelerators, detectors, and superconducting magnets.
- The physics of energy and matter, the chemistry and physics of materials and condensed matter, chemical energy sciences, biomedical and imaging sciences, energy and environmental sciences and technologies, and systems analysis and modeling.

Major User Facilities

Relativistic Heavy Ion Collider, the world's newest accelerator for nuclear physics.
National Synchrotron Light Source, provides researchers with intense light spanning the electromagnetic spectrum from the infrared through x-rays.
Alternating Gradient Synchrotron, home of three Nobel Prizes and pivotal physics discoveries.
Scanning Transmission Electron Microscope, used to reveal the structure and function of proteins, nucleic acids, and other macromolecules, and to image single heavy atoms.
Accelerator Test Facility, the U.S. proving ground for new concepts in accelerator physics.
Free Air Carbon Dioxide Enrichment Facility, designed, built and operated by Brookhaven, this loblolly pine plantation in the Duke Forest is grown at elevated carbon dioxide concentration to understand how ecosystems respond in a high carbon dioxide world.
NASA Space Radiation Laboratory, used to learn about the possible risks to human beings exposed to radiation in space, as well as to develop shielding materials for such a risk.
Center for Functional Nanomaterials, now under construction, will provide researchers with state-of-the-art capabilities to fabricate and study materials and properties at the nanoscale.

Lab-at-a-Glance

Location: Upton, NY

Contract Operator: Brookhaven Science Associates (Research Foundation of State University of New York and Batelle Memorial Institute)

Responsible Field Office: Brookhaven Site Office

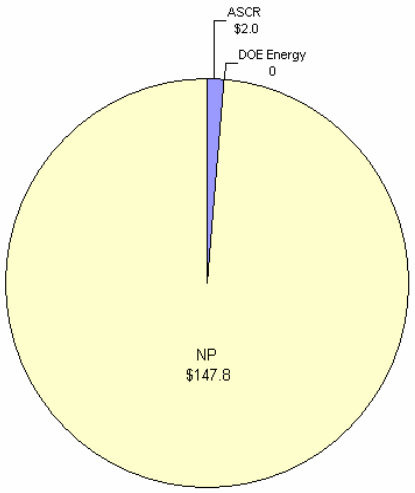
Website: http://www.bnl.gov

Human Capital:

- 2607 Full-time equivalent employees;
- 1829 Grad/undergrad students
- 3736 Facility users, visiting scientists

FY 2006 Total DOE Funding: $414.9M

FY 2006 DOE Funding by Source
PALS data (BA in Millions):



FY 2006 Non-DOE Funding: $72.1M

ASCR: Advanced Scientific Computing Research
NP: Nuclear Physics

Recent Scientific Achievements

- 2003 Nobel Prize in chemistry awarded to biophysicist Roderick MacKinnon, M.D., for structural and mechanistic studies of ion channels.
- 2002 Nobel Prize in physics given to chemist Raymond Davis Jr. for solar neutrino research.
- At the Relativistic Heavy Ion Collider, creation of a new state of matter that behaves more like a liquid than a gas, giving insight into the earliest moments of the universe.
- Brain imaging studies that have gained international recognition.
- Direct measurement of the electronic structure of a single carbon nanotube and the activation of light emission from one of these nanotubes, which, together with the nanotube's known physical properties, may help scientists determine its usefulness in various applications, such as microelectronics and optics.
- Synthesis of a new class of electrocatalysts with decreased materials cost and enhanced performance factors that are critical for improving fuel cells.

Awards

- Six Nobel Prizes: five in physics and one in chemistry
- The 1983 and 2002 National Medal of Science
- The 1991 and 2000 Wolf Prize
- The 1986, 1987, 1988, and 2002 Fermi Award
- Eleven Lawrence Awards
- Numerous R&D 100 Awards

Fermilab

Leadership in Science

Fermi National Accelerator Laboratory, also known as Fermilab, is the largest U.S. laboratory dedicated to research in particle physics. The laboratory was established in 1967 on 6800 acres of northern Illinois land, in Batavia, Il., about 45 miles west of Chicago. The original Fermilab Main Ring became the world's highest energy accelerator when it started operation in 1971. The Tevatron, commissioned in 1983, was the first large proton accelerator based on superconducting magnet technology. Approximately 2250 scientists from 210 institutions in 35 states and 27 countries carry out research at the energy frontier, the highest-energy environment for discovery in the world today. Fermilab scientists also pursue research in particle astrophysics and cosmology, exploring the convergence of the inner space of the tiniest elementary particles and the outer space of the structure, and evolution of the universe.

Mission

Fermilab's mission is to provide the facilities and resources necessary to understand the fundamental nature of matter and energy and to conduct research at the frontiers of high energy physics and related disciplines.

Core Competencies

- Construction and operation of accelerator facilities for particle physics
- Construction and operation of experimental facilities for particle physics and particle astrophysics
- Research, design, and development of accelerator technology
- High-performance scientific computing and networking
- International scientific collaboration
- Theoretical particle physics and astrophysics

Major User Facilities

The four-mile-circumference Tevatron proton-antiproton collider, the world's most powerful particle accelerator.
The Booster accelerator, providing beam for the MiniBooNE neutrino experiment.
The Main Injector accelerator, providing beam for the NuMI (Neutrinos at the Main Injector) experiment.
The two 5,000-ton collider detectors, CDF and D Zero, each serve an international collaboration of more than 500 university physicists.
The long-baseline MINOS experiment, officially launched in 2005, will study the question of neutrino mass and the neutrino mass hierarchy.
The short-baseline MiniBooNE experiment will confirm or

Lab-at-a-Glance

Location: Batavia, IL

Contract Operator: Fermi Research Alliance, LLC

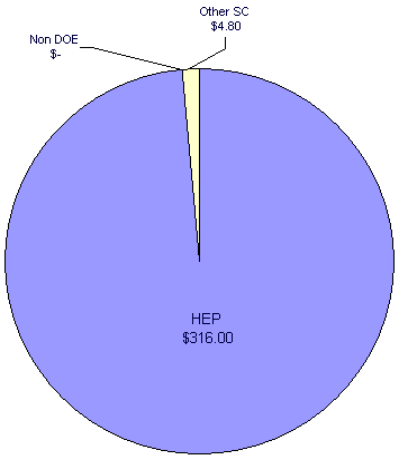
Responsible Site Office: Fermi Site Office

Website: http://www.fnal.gov

Human Capital:
- 1,967 employees;
- 615 Students (Undergraduate and Graduate);
- 2,310 Facility Users and Visiting Scientists

FY 2006 Total DOE Funding: $321M

FY 2006 DOE Funding by Source
PALS data (BA in Millions):



FY 2006 Non-DOE Funding: $0.2M

HEP: High Energy Physics

refute evidence for a fourth type of neutrino, confirming or disproving the Standard Model.
The CMS (Compact Muon Solenoid) experiment at CERN, for which Fermilab serves as host for the U.S. collaboration component (US CMS), and as home for the US CMS research program involving nearly 400 scientists.
The Lattice Gauge Theory Computing Facility, where approximately 60 user theorists work with the theory of quantum chromodynamics with teraflop computing power.
The Particle Astrophysics Center, encompassing the Sloan Digital Sky Survey, the Pierre Auger Cosmic Ray Observatory, and the Cryogenic Dark Matter Search, and proposed projects including the SuperNova Acceleration Probe of the Joint Dark Energy Mission, and the Dark Energy Survey, where Fermilab is building a camera for the Cerro Tololo Interamerican Observatory (CTIO) in Chile.

Recent Scientific Achievements

Discoveries at Fermilab during the 35 years of its history have helped to define the growing understanding of the fundamental nature of the universe and how it works. The discovery of the bottom quark in 1977 and the top quark in 1995, and the first observation of the Tau Neutrino in 2000, have shaped the current picture of the basic structure of matter, known to physicists as the Standard Model of Fundamental Particles and Forces. Now the stage is set for new discoveries and new physics at the Tevatron in the months and years ahead.

Awards

- Presidential Medal of Technology, presented to four Fermilab scientists for development and construction of the Tevatron.

U. S. Department of Energy's

Jefferson Lab

Thomas Jefferson National Accelerator Facility

Leadership in Science

Jefferson Lab is a world-class research facility offering unique capabilities to explore and understand the subnuclear realm of quarks and gluons. Jefferson Lab provides an electron beam of unprecedented quality, complementary particle detection systems in each of three experimental halls, and computational and theoretical support. On average, the lab runs about a dozen experiments each year; and research conducted at the lab is the basis for 25 percent of all U.S. nuclear physics PhD theses. Critical Decision-1 was awarded for a planned energy upgrade of Jefferson Lab's accelerator to 12 GeV (billion electron volts) with a new experimental hall and upgrades to the existing experimental equipment. Jefferson Lab also operates a record-breaking energy-recovering Free-Electron Laser, successfully developed, produced and commissioned the cold linear accelerator for DOE's Spallation Neutron Source.

Mission

The primary mission of Jefferson Lab is to conduct nuclear physics research into the quark-gluon structure of nuclei, nucleons, and mesons, in particular, the strong interaction confinement regime.

Core Competencies

- Experimental and theoretical nuclear and particle physics.
- Advanced detectors and data acquisition and analysis technology.
- Lattice Quantum Chromodynamics calculations
- Superconducting radiofrequency (srf)
- Energy-recovering linacs (ERLs)
- Efficient operation (people and energy) of 2 Kelvin (-456 F) cryogenic systems with integrated controls for large accelerator applications
- Highly polarized beams and related accelerator technologies
- Energy recovering, high average power, high brightness free-electron lasers (FELs)
- Medical instrumentation and diagnostic technology
- Innovative community outreach programs enhancing K-12 math and science education

Major User Facilities

Continuous Electron Beam Accelerator Facility, a unique continuous-wave, upgradeable 6 billion electron volt (GeV) beam capable of delivering highly polarized electron beam to three separate experimental halls simultaneously, each equipped with complementary experimental apparatus.

Lab-at-a-Glance

Location: Newport News, VA

Contract Operator: Jefferson Science Associates, LLC (JSA)

Responsible Site Office: Thomas Jefferson Site Office

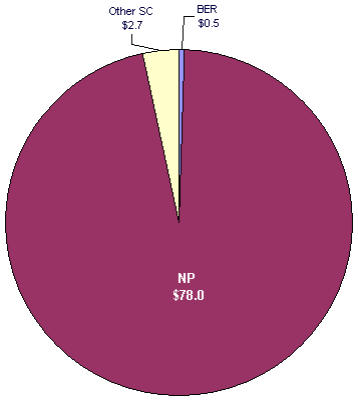
Website: http://www.jlab.org

Human Capital:

- 628 Employees;
- 230 Students (Undergraduate and Graduate);
- 2,000 Facility Users and Visiting Scientists

FY 2006 Total DOE Funding: $414.9M

DOE Funding by Source (in Millions):



FY 2006 Work for Others: $11.2M

NP: Nuclear Physics
BER: Biological and Environmental Research

Free-Electron Laser (FEL), a superconducting radiofrequency-based laser that has delivered 10 kilowatts (kW) of infrared light, provided proof-of-principle for energy-recovering linacs, and is now spawning a new generation of FELs built on its design.

Recent Scientific Achievements

- Developed a new accelerator cavity fabrication process that simplifies manufacturing while reducing cost and assembly time and produced a near-record performance cavity in the same shape as the low-loss design proposed as an improvement to the baseline for the International Linear Collider (ILC).
- Discovered a dramatic, unexpected difference between the charge and magnetization distribution of the proton, revealing a significant role for quark angular momentum in the structure of the proton.
- Measured the strange quark contributions to the structure (electric and magnetic form factors) of protons and neutrons through the highest-precision parity-violation experiments ever run and achieved excellent agreement with state-of-the-art theoretical calculations.
- Determined the charge distribution of the neutron, providing crucial insights into the structure of hadrons, subatomic particles built of three quarks.
- Determined from measurements of deuteron form factors and deuteron photodisintegration the distance scale below which the description of the nucleus as made up of protons and neutrons is no longer applicable and we must include the underlying quarks and gluons.
- Established an upper limit on the existence of the pentaquark with an order of magnitude higher precision than any other facility.
- Mapped the transition of the nucleon spin structure from its static integral properties (such as the total spin) to its underlying quark-gluon structure by measurements of the Bjorken sum rule.
- Conducted the most precise measurement of the structure of the pion, the lightest particle built of quarks and arguably the most important of the mesons due to its Goldstone nature (it has an unusually small mass).
- Established a theoretical framework for mapping the three dimensional quark-gluon structure of nucleons and performed the first experiments to validate this framework.

Awards

- Two R&D 100 Awards

Berkeley Lab

Leadership in Science

Lawrence Berkeley National Laboratory has been a leader in science and engineering research for more than 75 years. LBNL was founded in 1931 by Ernest O. Lawrence, whose invention of the cyclotron opened the door to the age of particle physics. The Lab also provides training for nearly 1,000 students from the University of California Berkeley.

Mission

LBNL's mission advances four distinct goals for DOE and the Nation:

- To perform leading multidisciplinary research in the computing sciences, physical sciences, biology and environmental sciences, and general sciences in a manner that ensures employee and public safety and protection of the environment.
- To develop and operate unique national experimental facilities for qualified investigators.
- To educate and train future generations of scientists and engineers to promote national science and education goals.
- To transfer knowledge and technological innovations and to foster productive relationships among LBNL's research programs, universities, and industry in order to promote national economic competitiveness.

Core Competencies

- Advanced energy science and technology
- Nanotechnology and materials characterization
- Multidisciplinary biology and environmental science
- Chemical physics and ultrafast science
- Computational science and engineering
- Advanced detector systems for physics and nuclear security
- Photon and particle beams

Major User Facilities

Advanced Light Source, a synchrotron radiation facility that generates intense light for scientific and technological research.
National Center for Electron Microscopy, a facility housing several of the world's most advanced microscopes and tools for microcharacterization of materials.
National Energy Research Scientific Computing Center, a world leader in providing high-performance computing tools and expertise that enable computational science of scale.
Energy Sciences Network (ESnet), a high-speed computing network serving thousands of DOE scientists and collaborators worldwide.
Molecular Foundry, a user facility for the design, synthesis and characterization of nanoscale materials.

Lab-at-a-Glance

Location: Berkeley, CA

Contract Operator: University of California

Responsible Field Office: Berkeley Site Office

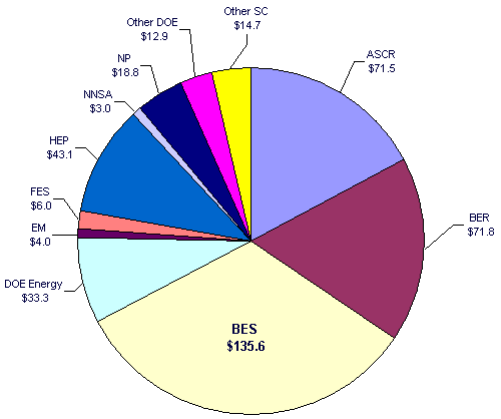
Website: http://www.lbl.gov/

Human Capital:

- 3000 full time employees;
- 1400 Students (Undergraduate and Graduate and guests);
- 3200 Facility Users and Visiting Scientists

FY 2006 Total DOE Funding: $414.9M

FY 2006 DOE Funding by Source
PALS data (BA in Millions):



FY 2006 Non-DOE Funding: $114M

BER: Biological and Environmental Research
BES: Basic Energy Sciences
HEP: High Energy Physics
NP: Nuclear Physics
FES: Fusion Energy Sciences
ASCR: Advanced Scientific Computing Research
EM: Environmental Management
NNSA: National Nuclear Security Administration

Recent Scientific Achievements

- Discovery of mysterious "dark energy" that acts like antigravity, forcing, the universe to expand forever.
- Development of hybrid organic/semiconductor nanocrystal solar cells with promising power efficiency
- Demonstration of an important link between the development of breast cancer and the extracellular matrix.
- Discovery of a gene linked to high-triglyceride levels and heart disease through the comparison of the mouse genome to the human genome.
- Creation of the world's smallest electrical switch consisting of a single Buckyball molecule.
- Construction of the world's strongest magnet that reached a field-strength of 300,000 times the strength of Earth's magnetic field.
- Observation of hot and cold ripples in the microwave radiation afterglow of the Big Bang which are thought to be the primordial seeds from which our present-day universe grew
- Achievement of quality femtosecond electron beams at GeV energies by centimeter-scale optical accelerators

Awards

- 11 Nobel Prizes awarded to LBNL scientists
- 13 National Medals of Science
- 5 Fermi Awards, 26 Lawrence Awards
- 41 R&D Awards, 4 in 2006

OAK RIDGE National Laboratory

Leadership in Science

Oak Ridge National Laboratory is among the Nation's largest science and energy laboratories. Established in 1943 as a part of the secret Manhattan Project to pioneer a method for producing and separating plutonium, ORNL today is an international leader in a range of scientific areas, including neutron science, high-performance computing, energy, advanced materials, complex biological systems, and national security. The $1.4 billion Spallation Neutron Source, scheduled for completion in 2006, will make ORNL the world's foremost center for neutron science research.

Mission

ORNL is a world leader in materials science and energy research, with six primary mission roles:

- Delivering and sustaining the world's foremost center for neutron scattering
- Leadership in computational science and engineering
- Leadership in materials science through discovery, synthesis, and characterization of materials at the nanoscale
- Leadership in microbial biology and proteomics, producing bio-based solutions to energy challenges and enabling the new field of "ecogenomics"
- Leadership in energy technology through science
- Delivering "first-of-a-kind" science-based security technologies and implementing nuclear nonproliferation programs

Core Competencies

- Materials Design, Synthesis and Characterization
- Computational Science and Engineering
- Microbial Biology, Ecology, and Biotechnology
- Sensors and Electronics
- Nuclear Science, Engineering, and Technology
- Plasma Physics and Engineering
- Molecular Processes and Analytical Chemistry
- Scientific Instruments and Facility Development

Major User Facilities

Center for Nanophase Materials Sciences, DOE's first nanoscience center.

High Flux Isotope Reactor, which was recently upgraded for neutron research.

High Temperature Materials Laboratory, for advanced materials research.

Lab-at-a-Glance

Location: Oak Ridge, TN

Contract Operator: UT-Battelle (partnership between University of Tennessee and Battelle Memorial Institute)

Responsible Field Office: Oak Ridge Office (ORO)

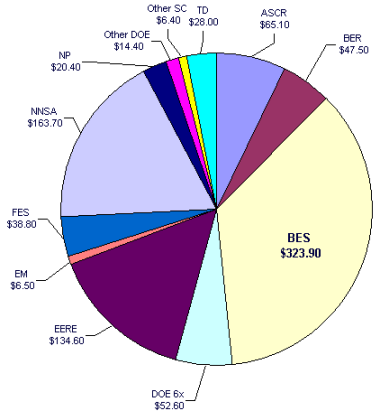
Website: http://www.ornl.gov/

Human Capital:

- 4,106 employees;
- 1736 Students (Undergraduate and Graduate);
- 2478 Facility Users and Visiting Scientists

FY 2006 Total DOE Funding: $902M

FY 2006 DOE Funding by Source
PALS data (BA in Millions):



FY 2006 Non-DOE Funding: $189.7M

BES: Basic Energy Sciences
BER: Biological and Environmental Research
NP: Nuclear Physics
FES: Fusion Energy Sciences
ASCR: Advanced Scientific Computing
EM: Environmental Management
NNSA: National Nuclear Security Administration
EERE: Energy Efficiency and Renewable Energy
TD: Technology Development
DOE 6x: Other DOE labs

Holifield Radioactive Ion Beam Facility, for nuclear physics and astrophysics research.
Mouse Genetics Research Facility, for mouse genetics and genomics research.
National Center for Computational Sciences, for large-scale scientific computing.
National Transportation Research Center, for transportation technologies research.
Spallation Neutron Source (SNS), for neutron analysis of materials.

Recent Scientific Achievements

- Spallation Neutron Source project is completed. The SNS had produced neutrons.
- World's highest resolution (0.6 angstrom) images with Z-contrast scanning transmission electron microscope.
- Graphite Foam, a lightweight carbon-based material with superlative heat-transfer properties.
- Fluorine-17 beam, a powerful radioactive ion beam providing insight into the interstellar processes that have ultimately resulted in life on Earth.
- Lab on a Chip, glass microchips etched to form channel and chambers, which have benefited industries that must experiment with rare, expensive samples.
- Rolling-Assisted Biaxial Textured Substrates (RABiTS), a major step toward lengths of superconducting cable for power transmission.
- Super-Efficient Water Heater, a "drop-in" replacement for a conventional 50 or 80-gallon water heater that could cut the Nation's energy use by 1 percent.

Awards

- Two Nobel Prizes
- Six Fermi Awards
- 128 R&D 100 Awards, six in 2006

Pacific Northwest National Laboratory

...delivering breakthrough science and technology

Leadership in Science

Pacific Northwest National Laboratory was established in 1965 when the federal government's research laboratory at DOE's Hanford Site in eastern Washington State was separated from Hanford operations. The original research focus was on nuclear technology, and the environmental and health effects of radiation. PNNL today has expanded into a diversified, multi-program laboratory that solves complex problems in energy, national security, the environment and life sciences by advancing the understanding of physics, chemistry, biology and computation.

Mission

PNNL performs basic and applied research to deliver energy, environmental, and national security for our Nation.

Core Competencies

- Microbial and cellular biology
- Environmental sciences
- Analytical and interfacial chemical sciences
- Radiological sciences
- Information analytics
- Sensing and measurement technologies

Major User Facilities

William R. Wiley Environmental Molecular Sciences Laboratory provides integrated experimental and computational resources for discovery and technological innovation in the environmental sciences.
Applied Process Engineering Laboratory, an Eastern Washington technology business startup center with engineering and manufacturing-scale space, as well as wet, bio and electronic laboratories.
Marine Research Operations facility on the coast of Washington state, where staff conduct environmental and coastal security research.

Recent Scientific Achievements

- Deployed at more than a dozen sites worldwide a commercially available security scanner that is based on PNNL's advanced holographic expertise. The system, called Safe Scout, is operational in Europe, the Middle East and Asia including entry points to Iraq, where the systems are supporting U.S. soldiers in detecting hidden improvised explosive devices and other concealed weapons.
- Completed the first comprehensive characterization of the whole mouse brain proteome. The work represents the most comprehensive proteome coverage for the mammalian brain to date. The approach may have broad applications for rapid proteomic analyses of various mouse models of human brain diseases.

Lab-at-a-Glance

Location: Richland, WA

Contract Operator: Battelle

Responsible Site Office: Pacific Northwest Site Office (Paul Kruger)

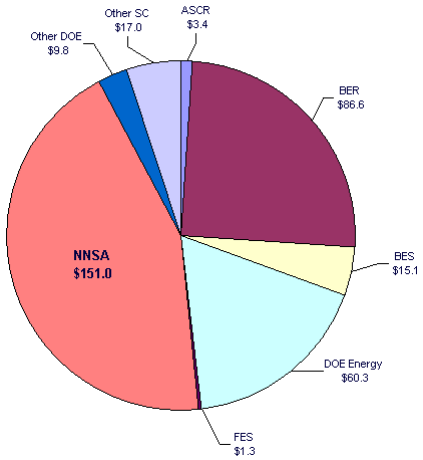
Website: http://www.pnl.gov/

Human Capital:

- 4,350 employees;
- 681 Students (Undergraduate and Graduate); This includes 451 students who work fulltime at the Lab, are designated as employees and are listed in the employee number above; as well as another 230 students who participated in the Lab's educational programs.
- 2,136 Facility Users

FY 2006 Total DOE Funding: $344.6M

FY 2006 DOE Funding by Source
PALS data (BA in Millions):



FY 2006 Non-DOE Funding: $396M*
** Includes $76M in indirect EM funding*

BER: Biological and Environmental Research
FES: Fusion Energy Sciences
ASCR: Advanced Scientific Computing Research
NNSA: National Nuclear Security Administation
BES: Basic Energy Sciences

- Designed a new way to build charge-transporting molecular structures from small fragments that successfully combines the optical properties of small, organic molecules with the thin film properties of larger molecules—a breakthrough that will enable an entire new class of power efficient organic light emitting devices appropriate for solid state lighting.
- Studied the detailed geochemistry of uranium in the subsurface at a former plutonium production site near the Columbia River, a major Northwest waterway. The uranium has persisted for more than 30 years in spite of predictions that it would dissipate. Based on the studies, the updated model for uranium fate and transport will be used to evaluate future risks and decide among cleanup alternatives.
- Developed a sophisticated "sequence alignment tool" that can divide the work of analyzing biological data into manageable fragments so large data sets can run on many processors simultaneously. This powerful data-intensive technology means large-scale problems—such as analysis of an organism—can be solved in minutes rather than weeks, bringing goals like curing diseases, finding safer ways to clean up the environment, and protecting the country against biological threats one step closer to achievement.

Awards

- 71 R&D 100 Awards
- 62 Federal Laboratory Consortium awards (most of any DOE laboratory)
- 5 E.O. Lawrence Awards
- 2 Presidential Early Career Award for Science & Engineering (PECASE)
- 3 Discover Magazine Awards for Technological Innovation
- 1 Christopher Columbus Fellowship Foundation Award

PPPL
PRINCETON PLASMA PHYSICS LABORATORY

Leadership in Science

The Princeton Plasma Physics Laboratory is a world leader in the development of fusion as an inexhaustible, safe, and environmentally attractive means of generating electricity and hydrogen for the long-term. The Laboratory is studying the magnetic confinement of hot ionized gas, or plasma, as the fuel for fusion energy production. Magnetic fusion research at Princeton began in 1951 under the code name Project Matterhorn. Today the lab, located on the University's James Forrestal Campus in Plainsboro, NJ, is a leader in the integrated design, fabrication, and operation of experimental facilities for fusion research and for basic and applied plasma research.

Mission

PPPL is a collaborative national center for plasma and fusion science. Its primary mission is to develop the scientific understanding and the key innovations that will lead to an attractive fusion energy source. Associated missions include conducting world-class research along the broad frontier of plasma science and providing the highest quality of scientific education.

Core Competencies

- Experimental analysis of stability and confinement of fusion plasmas
- Plasma theory and computational physics for fusion and other applications
- Physics and engineering design and operation of experimental plasma fusion facilities, including the Tokamak Fusion Test Reactor which produced world-record levels of fusion power
- Computer engineering, including data acquisition, instrumentation, and control systems
- Physics and technology of plasma applications to advance industrial technologies
- Environmental, safety, and health aspects of the operation and removal of experimental fusion devices

Major User Facilities

National Spherical Torus Experiment (NSTX), studying the spherical torus plasma confinement configuration.
National Compact Stellarator Experiment (NCSX), a device to study a compact stellarator confinement configuration. Construction is now underway, with operation scheduled for 2009.

Lab-at-a-Glance

Location: Princeton, NJ

Contract Operator: Princeton University

Responsible Field Office: Princeton Site Office

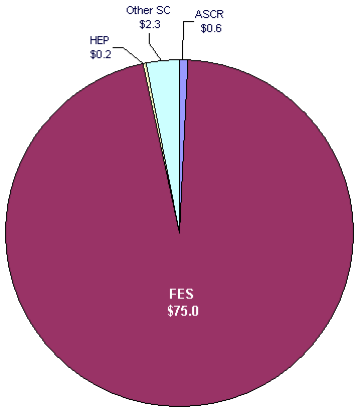
Website: http://www.pppl.gov/

Human Capital:

- 408 employees
- 35 graduate students
- 119 Facility Users and Visiting Scientists

FY 2006 Total DOE Funding: $78.1M

FY 2006 DOE Funding by Source
PALS data (BA in Millions):



FY 2006 Non-DOE Funding: $1.5M

FES: Fusion Energy Sciences
ASCR: Advanced Scientific Computing Research
HEP: High Energy Physics

Recent Scientific Achievements

- NSTX achieved its plasma current design specification (1 MA) nine months ahead of schedule.
- NSTX achieved 25 % beta 15 months ahead of schedule. Beta relates to the economics of fusion power production.
- NSTX achieved 35% beta three months ahead of its original 25% target date.
- NSTX achieved plasma current 50% above design specification.
- NSTX neutral-beam system achieved heating over 40% above design specification.
- NCSX began construction with area preparations and the placement of major subcontracts for the vacuum vessel and coil winding forms.
- Magnetic Reconnection Experiment (MRX) provided a comprehensive picture of driven magnetic reconnection, significantly impacting theory for both laboratory and space plasmas.
- Current Drive Experiment-Upgrade (CDX-U) conducted the world's first demonstration of tokamak plasma performance improvement with large area liquid lithium plasma-facing components.

Awards

- One Nobel Prize
- Three E.O. Lawrence Awards
- Five James Clerk Maxwell Prizes
- Two R&D 100 Awards

Leadership in Science

The Stanford Linear Accelerator Center (SLAC) was founded in 1962 and has gained international recognition for research and operation of major user facilities in synchrotron radiation science and particle physics. Three scientists have been awarded the Nobel Prize and there are 10 members of its faculty in the National Academies. Current research and scientific user facilities are in areas of photon science and particle astrophysics. SLAC's primary customers are the approximately 3000 students, postdocs and scientists from around the world who make use of its accelerator-based instrumentation and techniques for their research. With support from DOE, SLAC is embarking upon a major new direction with the construction, commissioning and operation of LCLS, the world's first x-ray free electron laser planned for operation in 2009.

Mission

To discover new scientific frontiers within the physical and life sciences by probing the ultra small and ultra fast world of materials, molecules and atoms with high brightness x-rays. To understand the fundamental physics of the birth and evolution of the universe by conducting theoretical studies and experiments in the interrelated disciplines of particle and particle astrophysics.

Core Competencies

- Photon science
- High-energy physics
- Advanced accelerator research
- Particle astrophysics

Major User Facilities

Stanford Synchrotron Radiation Laboratory, which provides synchrotron radiation, a name given to x-rays or light produced by electrons circulating in a storage ring at nearly the speed of light.
BaBar collaboration, which consists of approximately 600 physicists and engineers from 75 institutions in 10 countries. The project includes a detector that was built at SLAC to study the millions of B mesons produced by the PEP-II storage ring.
Linac Coherent Light Source (LCLS), the world's first x-ray free electron laser is under construction and experiments in 2009. SLAC is committed to the on-time and on-budget construction and rapid commissioning of this major new facility that will open revolutionary frontiers for photon science in the coming decades.

Lab-at-a-Glance

Location: Menlo Park, CA

Contract Operator: Stanford University

Responsible Field Office: Stanford Site Office

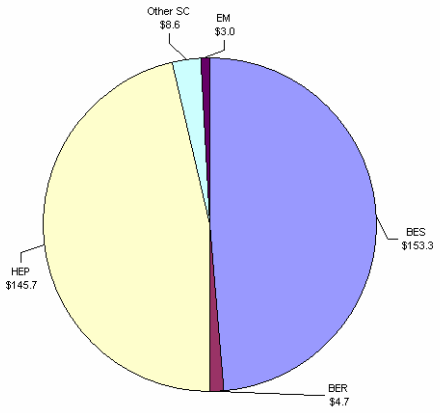
Website: www.slac.stanford.edu

Human Capital:

- 1525 full-time employees;
- 100 Students (Undergraduate and Graduate);
- 3000 Facility Users and Visiting Scientists

FY 2006 Total DOE Funding: $315.3M

FY 2006 DOE Funding by Source
PALS data (BA in Millions):



FY 2006 Non-DOE Funding: $23M

BER: Biological and Environmental Research
HEP: High Energy Physics
EM: Environmental Management
BES: Basic Energy Sciences

Recent Scientific Achievements

- Measurement of sin2b, a key measurement in the investigation of CP violation.
- Discovery of a new subatomic particle named Ds (2317) at the BaBar experiment

- Development of new lensless imaging technique, opening door to nanoscale world

Awards

- Four Nobel Prizes
- Multiple DOE E.O. Lawrence Awards
- 2 National Medals of Science
- 1 Wolf Prize
- 2 Enrico Fermi Awards

The Department of Energy's Office of Science

The U.S. Department of Energy's Office of Science is the single largest supporter of basic research in the physical sciences in the United States, providing more than 40 percent of total funding for this vital area of national importance. It oversees—and is the principal federal funding agency of—the Nation's research programs in high-energy physics, nuclear physics, and fusion energy sciences.

The Office of Science sponsors fundamental research programs in basic energy sciences, biological and environmental sciences, and computational science. In addition, the Office of Science is the Federal Government's largest single funder of materials and chemical sciences, and it supports unique and vital parts of U.S. research in climate change, geophysics, genomics, life sciences, and science education.

The Office of Science manages this research portfolio through six interdisciplinary program offices: Advanced Scientific Computing Research, Basic Energy Sciences, Biological and Environmental Research, Fusion Energy Sciences, High Energy Physics, and Nuclear Physics. In addition, the Office of Science sponsors a range of science education initiatives through its Workforce Development for Teachers and Scientists program.

The Office of Science makes extensive use of peer review and Federal advisory committees to develop general directions for research investments, to identify priorities, and to determine the very best scientific proposals to support.

The Office of Science also manages 10 world-class laboratories, which often are called the "crown jewels" of our national research infrastructure. The national laboratory system, created over a half-century ago, is the most comprehensive research system of its kind in the world.

Five are multi-program facilities: Argonne National Laboratory, Brookhaven National Laboratory, Lawrence Berkeley National Laboratory, Oak Ridge National Laboratory, and Pacific Northwest National Laboratory. The other five are single-program national laboratories: Ames Laboratory, Fermi National Accelerator Laboratory, Thomas Jefferson National Accelerator Facility, Princeton Plasma Physics Laboratory, and Stanford Linear Accelerator Center.

The Office of Science oversees the construction and operation of some of the Nation's most advanced R&D user facilities, located at national laboratories and universities. These include particle and nuclear physics accelerators, synchrotron light sources, neutron scattering facilities, supercomputers and high-speed computer networks. Each year these facilities are used by more than 19,000 researchers from universities, other government agencies, and private industry.

The Office of Science is a principal supporter of graduate students and postdoctoral researchers early in their careers. About 50 percent of its research funding goes to support research at more than 300 colleges, universities, and institutes nationwide.

The Office of Science also reaches out to America's youth in grades K-12 and their teachers to help improve students' knowledge of science and mathematics and their understanding of global energy and environmental challenges.

To attract and encourage students to choose an education in the sciences and engineering, the Office of Science also supports the National Science Bowl, an educational competition for high school students involving all branches of science. Each year, over 12,000 students participate in the contest, and some 300 finalists typically prepare for months to attend the national event in Washington, D.C.

www.science.doe.gov

Office of Science National Laboratories

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111 TASF
Ames, IA 50011-3020
Phone: (515) 294-9557
http://www.ameslab.gov/

Argonne National Laboratory
9700 S. Cass Avenue
Argonne, IL 60439
Phone: (630) 252-2000
http://www.anl.gov/

Brookhaven National Laboratory
P.O. Box 5000
Upton, NY 11973-5000
Phone: (631) 344-8000
http://www.bnl.gov/

Fermi National Accelerator Laboratory
P.O. Box 500
Batavia, IL 60510-0500
Phone (630) 840 3000
http://www.fnal.gov/

Thomas Jefferson National Accelerator Facility
12000 Jefferson Avenue
Newport News, VA 23606
Phone: (757) 269-7100
http://www.jlab.org/

Lawrence Berkeley National Laboratory
1 Cyclotron Road
Berkeley, CA 94720
Phone: (510) 486-4000
http://www.lbl.gov/

Oak Ridge National Laboratory
P.O. Box 2008
Oak Ridge, TN 37831
Phone: (865) 574-4160
http://www.ornl.gov/

Pacific Northwest National Laboratory
902 Battelle Boulevard
Richland, WA
Phone: (509) 375-2121
http://www.pnl.gov/

Princeton Plasma Physics Laboratory
P.O. Box 451
Princeton, NJ 08543-0451
Phone: (609) 243-2000
http://www.pppl.gov/

Stanford Linear Accelerator Center
2575 Sand Hill Road
Menlo Park, CA 94025
Phone: (650) 926-3300
http://www.slac.stanford.edu/